



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IPW

Applicant: Gunther Rogoll et al.

Serial No: 10/574,555 Filing Date: Apr. 3, 2006

Title: DIAGNOSTIC SYSTEM FOR A MODULAR FIELDBUS BOARD

May 18, 2006

Attorney's Docket No.: MSAT3

O P E R A T I O N S
MAY 25 2006
P A T E N T & T R A D E M A R K O F F I C E

TRANSMITTAL LETTER

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P.O. BOX 1450
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Transmitted herewith for filing is:

<X> Submission to a Claim of Priority

<X> The Commissioner is hereby authorized to charge any fees under 37 CFR. 1.16, 1.17 and 1.18 or any additional fees which may be required during the entire pendency of the application, or credit any overpayment, to Acct. No.11-0224. A duplicate copy of this sheet is enclosed. If and only if(r) account funds should be insufficient, immediately contact our associate, Lisa Zumwalt, at (703)415-0579, who will pay immediately to avoid deprivation of rights.

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Horst M. Kasper
Horst M. Kasper, 13 Forest Drive, Warren, N.J. 07059
Reg. No. 28,559 Tel.(908) 526-1717

CERTIFICATE OF MAILING under 37 CFR 1.8:

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Date: MAY 22 2006
%MSA265(May 18, 2006) 8/1/06

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MAY 25 2006
U.S. PATENT AND TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Gunther Rogoll et al.

Serial No: 10/574,555 Filing Date: April 3, 2006

Title: DIAGNOSTIC SYSTEM FOR A MODULAR FIELDBUS BOARD

May 18, 2006

Attorney's Docket No.: MSA265P1

SUBMISSION TO A CLAIM OF PRIORITY

Hon. Commissioner of Patents and Trademarks
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to Title 35, United States Code, Section 119 (1952), the applicants enclose a CERTIFIED COPY of the PCT Application No: PCT/GB2004/004077 filed on September 24, 2004.

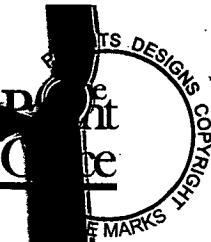
Respectfully submitted,

Gunther Rogoll et al.

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Reg. No. 28,559; Docket No.: MSA265

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CERTIFIED COPY OF PRIORITY DOCUMENT

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The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation and Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents held on the international application filed on **24 September 2004** under the Patent Cooperation Treaty at the UK Receiving Office. The application was allocated the number **PCT/GB2004/004077**.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in a certificate and any accompanying documents has re-registered under the Companies Act 2006 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or the inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

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Signed

Date: February 23, 2006

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PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

PCT/GB 2004/004077

International Application No.

24 SEPTEMBER 2004

24.09.04

International Filing Date

United Kingdom Patent Office
PCT International Application

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum)

JCBB/SPY/BUS

Box No. I TITLE OF INVENTION

DIAGNOSTIC SYSTEM FOR A MODULAR FIELDBUS BOARD

Box No. II APPLICANT

This person is also inventor

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

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Applicant's registration No. with the Office

State (that is, country) of nationality: DE

State (that is, country) of residence:

DE

This person is applicant for the purposes of: all designated States all designated States except the United States of America the United States of America only the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

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▲ GB

applicant only

applicant and inventor

inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:

GB

State (that is, country) of residence:

GB

This person is applicant for the purposes of: all designated States all designated States except the United States of America the United States of America only the States indicated in the Supplemental Box

Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:

agent

common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

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Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

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Box No. V DESIGNATIONS

The filing of this request constitutes under Rule 4.9(a), the designation of all Contracting States bound by the PCT on the international filing date, for the grant of every kind of protection available and, where applicable, for the grant of both regional and national patents.

However,

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- KR Republic of Korea is not designated for any kind of national protection
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(The check-boxes above may be used to exclude (irrevocably) the designations concerned in order to avoid the ceasing of the effect, under the national law, of an earlier national application from which priority is claimed. See the Notes to Box No. V as to the consequences of such national law provisions in these and certain other States.)

Box No. VI PRIORITY CLAIM

The priority of the following earlier application(s) is hereby claimed:

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country or Member of WTO	regional application: * regional Office	international application: receiving Office
item (1) 4 03.10.03 3 Oct. 2003	03 23178.4	GB		
item (2)				
item (3)				

Further priority claims are indicated in the Supplemental Box.

The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (*only if the earlier application was filed with the Office which for the purposes of this international application is the receiving Office*) identified above as:

all items item (1) item (2) item (3) other, see Supplemental Box

* Where the earlier application is an ARIPO application, indicate at least one country party to the Paris Convention for the Protection of Industrial Property or one Member of the World Trade Organization for which that earlier application was filed (Rule 4.10(b)(ii)):

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):

ISA / **EPO**

Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):

Date (day/month/year) Number Country (or regional Office)

Box No. VIII DECLARATIONS

The following declarations are contained in Boxes Nos. VIII (i) to (v) (mark the applicable check-boxes below and indicate in the right column the number of each type of declaration):

Number of declarations

<input type="checkbox"/> Box No. VIII (i)	Declaration as to the identity of the inventor	:
<input type="checkbox"/> Box No. VIII (ii)	Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent	:
<input type="checkbox"/> Box No. VIII (iii)	Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application	:
<input type="checkbox"/> Box No. VIII (iv)	Declaration of inventorship (only for the purposes of the designation of the United States of America)	:
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Sheet No. 3

Box No. IX CHECKLIST; LANGUAGE OF FILING

This international application contains:
 (a) in paper form, the following number of sheets:

request (including declaration sheets) : 3

description (excluding sequence listing and/or tables related thereto) : 5

claims : 3

abstract : 1

drawings : 1

Sub-total number of sheets : 13 0

sequence listing :

tables related thereto :

(for both, actual number of sheets if filed in paper form, whether or not also filed in computer readable form; see (c) below)

Total number of sheets : 13 0

(b) only in computer readable form (Section 801(a)(i))

(i) sequence listing

(ii) tables related thereto

(c) also in computer readable form (Section 801(a)(ii))

(i) sequence listing

(ii) tables related thereto

Type and number of carriers (diskette, CD-ROM, CD-R or other) on which are contained the

sequence listing:

tables related thereto:

(additional copies to be indicated under items 9(ii) and/or 10(ii), in right column)

This international application is accompanied by the following item(s) (mark the applicable check-boxes below and indicate in right column the number of each item):

1. fee calculation sheet
2. original separate power of attorney
3. original general power of attorney
4. copy of general power of attorney: reference number, if any:
5. statement explaining lack of signature
6. priority document(s) identified in Box No. VI as item(s):
7. translation of international application into (language):
8. separate indications concerning deposited microorganism or other biological material
9. sequence listing in computer readable form (indicate type and number of carriers)
 - (i) copy submitted for the purposes of international search under Rule 13ter only (and not as part of the international application)
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11. other (specify):

Figure of the drawings which should accompany the abstract: 1

Language of filing of the international application:

ENGLISH

Box No. X SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

A.J. BRIDGE-BUTLER
Agent for the Applicant

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1. Date of actual receipt of the purported international application:

24 SEPTEMBER 2004 24.09.04

3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:

4. Date of timely receipt of the required corrections under PCT Article 11(2):

5. International Searching Authority (if two or more are competent): ISA /

6. Transmittal of search copy delayed until search fee is paid

2. Drawings:

received:

not received:

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Date of receipt of the record copy by the International Bureau:

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-1-

DIAGNOSTIC SYSTEM FOR A MODULAR FIELDBUS BOARD

This invention relates to a diagnostic system for a modular fieldbus board, for use particularly to monitor fieldbus physical layer characteristics on a modular fieldbus board carrying a number of fieldbuses.

Therefore, according to the present invention a diagnostic system for a modular fieldbus board carrying a number of fieldbuses connected to a bulk power supply, comprises a monitoring transceiver means connected in use to one or more of the number of fieldbuses by means of two or more common mode and/or differential mode signal injection and/or signal detection points, which points are dispersed between the bulk power supply and the fieldbus trunk, such that the monitoring transceiver means can detect one or more fieldbus physical layer characteristics between two of the two or more of said points.

Preferably the fieldbus physical layer characteristics which are monitored comprise one or more of: over/under termination, noise/ripple level, signal level, signal bias, signal jitter, signal ringing, signal distortion, signal attenuation, cross talk, unbalance, and earth leakage.

In a preferred construction the monitoring transceiver means can also detect one or more characteristics of hardware carried on the modular fieldbus board by means of one or more of said points. The hardware can be the bulk power supply connections, power supply converters, power supply conditioners and the fieldbus trunks. The characteristics to be monitored can comprise one or more of: voltage, short circuit, hardware module failure, quiescent current, and rate of charge.

The monitoring transceiver means can also be adapted to gather received data and produce one or more of: Fourier analysis, trending analysis, and data logging.

Preferably the monitoring transceiver means may be adapted to provide an alarm in the event that received data indicates one or more of pre-determined failures or the one or more fieldbuses.

In one construction the monitoring transceiver means can be provided with a first digital and/or an analogue interface, such that diagnostic data detected and/or alarms created by the monitoring transceiver means in use are transmitted to a digital or analogue device operated by a user, and such that commands can be sent in use from the user operated digital or analogue device to operate the monitoring transceiver means.

Alternatively, or in addition to the first interface, the monitoring transceiver means can be provided with visual means adapted to display diagnostic data detected and/or alarms created.

In addition, the monitoring transceiver means can be provided with a second digital and/or an analogue interface, such that diagnostic data detected and/or alarms created by the monitoring transceiver means in use can be transmitted to other associated diagnostic systems.

Preferably the monitoring transceiver means can be removable from the fieldbus board, and it can be powered in use by the bulk power supply.

In one construction one or more of the two or more common mode and/or differential mode signal injection and/or signal detection points can be disposed actually within any of the hardware carried on the board.

The invention also includes a modular fieldbus board provided with a diagnostic system as described above.

Therefore, the invention also includes a modular fieldbus board comprising a number of fieldbuses connected to a bulk power supply, and a diagnostic system comprising a monitoring transceiver means connected to one or more of the number of fieldbuses by means of two or more common mode and/or differential mode signal injection and/or signal detection points, which points are dispersed between the bulk power supply and the fieldbus trunk, such that the monitoring transceiver means can detect one or more fieldbus physical layer characteristics between two of the two or more of said points.

Preferably each of the one or more fieldbuses can comprise a connection to the bulk power supply, a power supply converter, a power supply conditioner and a fieldbus trunk.

It will be appreciated that the two or more common mode and/or differential mode signal injection and/or signal detection points can be dispersed at any points in the fieldbuses. However, in a preferred construction on each of the one or more fieldbuses a first common mode signal injection and/or signal detection point can be disposed between the bulk power supply and the power supply converter, a second common mode signal injection and/or signal detection point can be disposed between the power supply converter and the power supply conditioner, a third a common mode signal injection and/or signal detection point can be disposed between the power supply conditioner and the field bus trunk, and a differential mode signal injection and/or signal detection point can be disposed between the third common mode signal injection and/or signal detection point and the fieldbus trunk.

In addition, in a preferred construction a fourth common mode signal injection and/or signal detection point can be disposed within the power supply converter, and a fifth common mode signal injection and/or signal detection point can be disposed within the power supply conditioner.

The invention can be performed in various ways, but one embodiment will now be described by way of example and with reference to Figure 1, which shows a diagrammatic display of a modular fieldbus board according to the present invention.

As shown in Figure 1, a modular fieldbus board comprises a backplane 15, on which is mounted any number of fieldbuses 8a, 8b and 8n in series and a monitoring transceiver means 17, (which may also be described by those in the art as a segment autonomous diagnostic system). (The fieldbuses comprise at least fieldbuses 8a and 8b, while 8n diagrammatically signifies any number of further fieldbuses, and is therefore shown in hashed lines.)

The fieldbuses 8a to 8n are connected to bulk power supply 1, and each comprise a power supply converter 3 and a power conditioner 5.

The monitoring transceiver means 17 is provided with a first digital interface, signified by arrow 16, which in use interfaces with a user operated digital control system. Further the monitoring transceiver means 17 is provided with a second digital interface, signified by hashed arrow 19, which in use can interface with similar diagnostic systems provided on associated modular fieldbus boards (not shown).

The monitoring transceiver means 17 is further provided with visual means (signified by arrows 14) which can provide information and warning signals direct to users.

The monitoring transceiver means 17 is connected to each fieldbus 8a to 8n by first common mode signal injection and detection point 2 between the bulk power supply 1 and the power supply converter 3, by second common mode signal injection and signal detection point 4 between the power supply converter 3 and the power supply conditioner 5, by third a common mode signal injection and signal detection point 6 between the power supply conditioner 5 and the field bus trunk (not shown), and by differential mode signal injection and signal detection point 7 between the

third common mode signal injection and signal detection point 6 and the fieldbus trunk (not shown).

In addition, the monitoring transceiver means 17 is connected to each fieldbus by fourth common mode signal injection and signal detection point (not visible, but indicated by connection arrow 9) which is disposed within the power supply converter 3, and by fifth common mode signal injection and signal detection point (again, not visible but indicated by connection arrow 11) disposed within the power supply conditioner 5.

The monitoring transceiver means 17 can monitor for fieldbus physical layer characteristics including over/under termination, noise/ripple level, signal level, signal bias, signal jitter, signal ringing, signal distortion, signal attenuation, cross talk, unbalance, and earth leakage, between any of the above described points.

In addition, the monitoring transceiver means 17 can monitor for voltage, short circuit, hardware module failure, quiescent current, and rate of charge, between any of the above described points.

The monitoring transceiver means 17 is programmed to compile received data in use and produce Fourier analysis, trending analysis, and data logging.

Further, the monitoring transceiver means 17 is programmed to provide an alarm, either via the interfaces 16 or 19, or the visual means 14, in the event that data in use indicates one or more of pre-determined failures or the one or more fieldbuses. The indications of failures in the data are pre-programmed into the transceiver 17.

Thus, the modular fieldbus board can provide many types of information on its performance and on any potential failures to a user.

Claims

1. A diagnostic system for a modular fieldbus board carrying a number of fieldbuses connected to a bulk power supply, comprising a monitoring transceiver means adapted in use to one or more of the number of fieldbuses by means of two or more common mode and/or differential mode signal injection and/or signal detection points, which points are dispersed between the bulk power supply and the fieldbus trunk, such that the monitoring transceiver means can detect one or more fieldbus physical layer characteristics between two of the two or more of said points.
2. A diagnostic system as claimed in Claim 1 in which the fieldbus physical layer characteristics comprise one or more of: over/under termination, noise/ripple level, signal level, signal bias, signal jitter, signal ringing, signal distortion, signal attenuation, cross talk, unbalance, and earth leakage.
3. A diagnostic system as claimed in Claim 1 or 2 in which the monitoring transceiver means also detects one or more characteristics of hardware carried on the modular fieldbus board by means of one or more of said points.
4. A diagnostic system as claimed in Claim 3 in which the one or more characteristics of hardware comprise one or more of: voltage, short circuit, hardware module failure, quiescent current, and rate of charge.
5. A diagnostic system as claimed in Claim 4 in which the monitoring transceiver means is adapted to gather received data and produce one or more of: Fourier analysis, trending analysis, and data logging.
6. A diagnostic system as claimed in any of the preceding Claims in which the monitoring transceiver means is adapted to provide an alarm in the event that received data indicates one or more of pre-determined failures or the one or more fieldbuses.

7. A diagnostic system as claimed in any of the preceding Claims in which the monitoring transceiver means is provided with a first digital and/or an analogue interface, such that diagnostic data detected and/or alarms created by the monitoring transceiver means in use are transmitted to a digital or analogue device operated by a user, and such that commands are sent in use from the user operated digital or analogue device to operate the monitoring transceiver means.
8. A diagnostic system as claimed in Claim 7 in which the monitoring transceiver means is provided with a second digital and/or an analogue interface, such that diagnostic data detected and/or alarms created by the monitoring transceiver means in use are transmitted to other associated diagnostic systems.
9. A diagnostic system as claimed in any of Claim 6 to 8 in which the monitoring transceiver means is provided with visual means adapted to display diagnostic data detected and/or alarms created.
10. A diagnostic system as claimed in any of the preceding Claims in which the monitoring transceiver means is removable from the fieldbus board.
11. A diagnostic system as claimed in any of the preceding Claims in which the monitoring transceiver means is connected to the bulk power supply.
12. A diagnostic system as claimed in any of the preceding Claims in which one or more of the two or more common mode and/or differential mode signal injection and/or signal detection points are disposed within hardware carried on the board.
13. A modular fieldbus board comprising a number of fieldbuses connected to a bulk power supply, and a diagnostic system comprising a monitoring transceiver means connected to one or more of the number of fieldbuses by means of two or more common mode and/or differential mode signal injection and/or signal detection points, which points are dispersed between the bulk power supply and the

fieldbus trunk, such that the monitoring transceiver means can detect one or more fieldbus physical layer characteristics between two of the two or more of said points.

14. A modular fieldbus board as claimed in Claim 13 in which each of the one or more fieldbuses comprise a connection to the bulk power supply, a power supply converter, a power supply conditioner and a fieldbus trunk.

15. A modular fieldbus board as claimed in Claim 14 in which on each of the one or more fieldbuses a first common mode signal injection and/or signal detection point is disposed between the bulk power supply and the power supply converter, in which a second common mode signal injection and/or signal detection point is disposed between the power supply converter and the power supply conditioner, in which third a common mode signal injection and/or signal detection point is disposed between the power supply conditioner and the field bus trunk, and a differential mode signal injection and/or signal detection point is disposed between the third common mode signal injection and/or signal detection point and the fieldbus trunk.

16. A modular fieldbus board as claimed in Claim 15 in which a fourth common mode signal injection and/or signal detection point is disposed within the power supply converter, and in which a fifth common mode signal injection and/or signal detection point is disposed within the power supply conditioner.

Abstract

A diagnostic system for a modular fieldbus board carrying a number of fieldbuses connected to a bulk power supply, comprising a monitoring transceiver means adapted in use to one or more of the number of fieldbuses by means of two or more common mode and/or differential mode signal injection and/or signal detection points, which points are dispersed between the bulk power supply and the fieldbus trunk, such that the monitoring transceiver means can detect one or more fieldbus physical layer characteristics between two of the two or more of said points.

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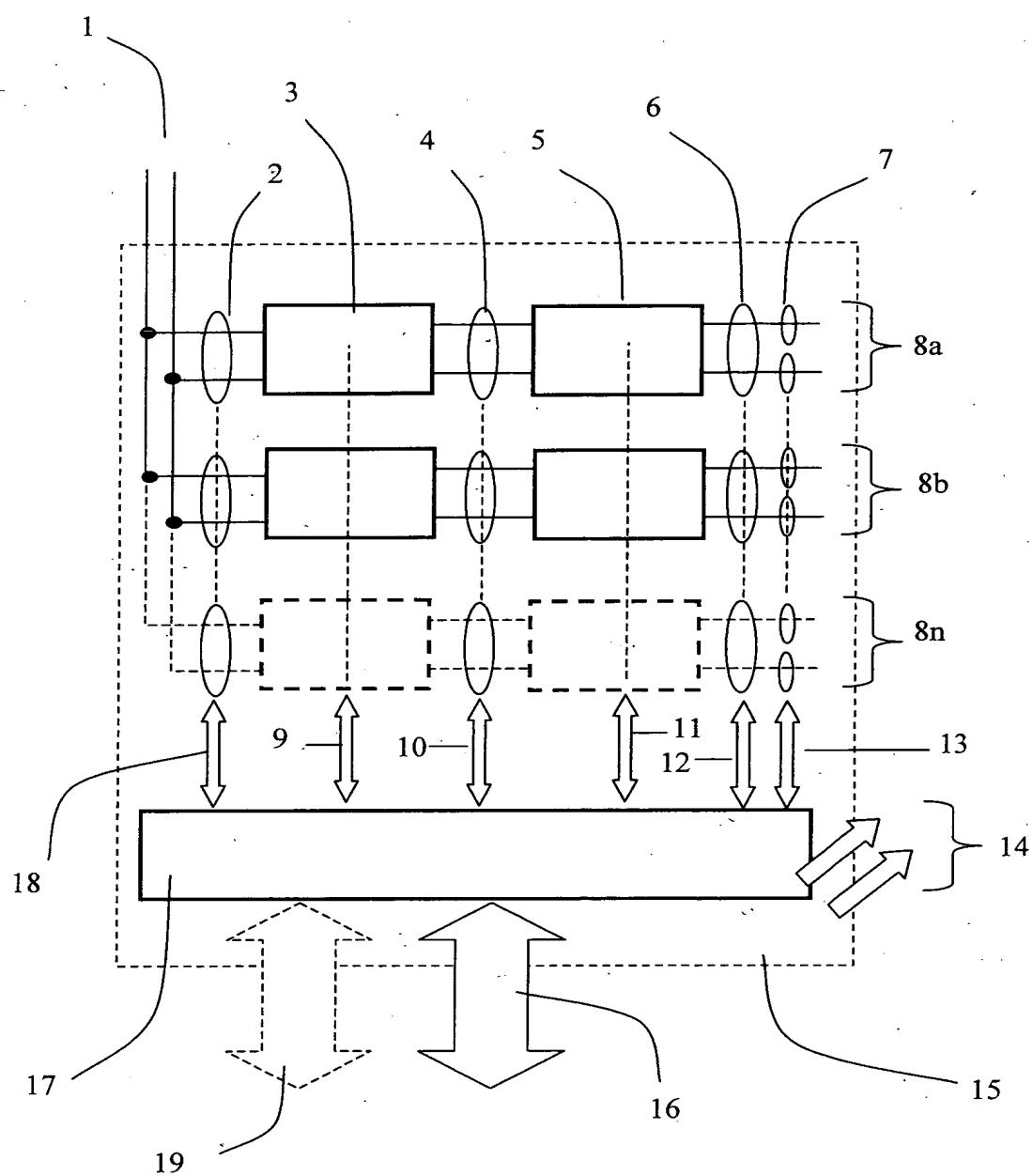


FIGURE 1

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